

THURSDAY, OCTOBER 2, 1884

## THE "CHALLENGER" REPORTS

*Report of the Scientific Results of the Voyage of H.M.S. "Challenger" during the Years 1873-76 under the Command of Capt. George S. Nares, R.N., F.R.S., and Capt. Frank Tourle Thomson, R.N.* Prepared under the Superintendence of the late Sir C. Wyville Thomson, Knt, F.R.S., &c., and now of John Murray, F.R.S.E., one of the Naturalists of the Expedition. Zoology—Vol. IX. Text and Plates. Two Vols. (Published by Order of Her Majesty's Government, 1884.)

ANOTHER volume forming Part XXII. of the Zoological Series of Reports on the Scientific Results of the *Challenger* Expedition has just been published, containing an account of the Foraminifera by H. B. Brady, F.R.S. It will be universally acknowledged that the task of preparing this Report could not have been intrusted to abler hands. The representatives of this interesting group of animals, writes Mr. Murray in an editorial note, are universally distributed over the floor of the ocean and in its surface and sub-surface waters, and the presence or absence of certain surface forms in the deposits from different depths and localities is intimately connected with some of the most remarkable and intricate problems of general Oceanography. It was therefore of the first importance that one very familiar with the group of the Foraminifera should have been chosen to undertake so vast an amount of labour as was requisite to investigate the enormous quantity of material that was collected. The Report itself is the best evidence of the great success which has attended Mr. Brady's investigations; it consists of a volume of text of over 800 pages, and is accompanied by a volume of 115 very exquisitely executed plates.

While the chief part of the Report is taken up with the descriptions of the new or rare species of Foraminifera furnished by the various bottom-dredgings and tow-net gatherings obtained during the *Challenger* Expedition, the author has also included some account of the collections made in the regions of the North Atlantic, which, though not visited by the *Challenger*, were explored during the expedition of the *Porcupine* in 1869, and he has made the survey of the group more complete by also referring to the forms found during the cruise of the *Knight Errant* in 1880, and during the British and Austro-Hungarian North Polar Expeditions.

The Report, however, contains a great deal more than descriptions of new or rare species. From Mr. Brady's large acquaintance with the multifarious forms to be met with in the group and with its literature, he has been enabled to treat in a full and able manner the subject of the classification of these forms, and has thereby developed this Report into an elaborate monograph of recent Foraminifera.

In an admirably written introduction a sketch is given of the gradual development of our knowledge of these forms from the time of D'Orbigny (1826) to the present, and an elaborately compiled bibliography is appended. The various classifications of the Rhizopods, from that of

Dujardin in 1841 to that of Leidy in 1879, are glanced at. More details are given as to the various attempts at classifying the Foraminifera, and the author proposes a scheme differing in many respects, and often widely, from those given by previous writers, but one which, in its essential elements, is in no way incompatible with the different conclusions at which they had arrived. The nature of the investment of the animal—that is to say, the minute structure of its test—as an exclusive basis for the primary divisions of the order, has been abandoned. While under all circumstances it furnishes important characters, and is even in some families quite distinctive, it is nevertheless a fact that, whilst there are certain groups which are invariably arenaceous, and some which are always calcareous and perforate, there are yet others in which no uniform rule obtains. The author omits any division of the order into sub-orders, not finding any easily-recognised characters to serve as a basis for such subdivision, and he divides the order at once into families. These families are (1) Gromidæ, (2) Miliolidæ, (3) Astorhizidæ, (4) Lituolidæ, (5) Textularidæ, (6) Cheilostomidæ, (7) Lagenidæ, (8) Globigerinidæ, (9) Rotalidæ, (10) Nummulinidæ. The Gromidæ, a family composed chiefly of fresh-water organisms, "have been a source of considerable trouble, on account of the want of accuracy and detail in the published descriptions of a number of types more or less closely allied to the group, and only such genera have been included as are known to have long, reticulated pseudopodia." In this portion of the subject the author has had the advantage of the advice of his friend William Archer. "The sub-family Dactyloporinæ, which in the original draft was placed with some reservation amongst the Miliolidæ, pending the fuller publication of the results of Munier-Chalmas's researches, is now entirely omitted. The examination of specimens brought under my notice by E. Perceval Wright and C. Schlumberger has removed any doubt left on my mind as to the propriety of the transfer of the entire group to the calcareous Algæ." The singular genus *Bathysiphon* of Sars has been removed to the Astorhizidæ.

With reference to the subject of nomenclature, the following are Mr. Brady's views, which seem founded on common sense, and with which we entirely agree. It is surely not requisite in a group like this "that a uniform standard of fixity of characters should be adopted, or that a set of beings of low organisation and extreme variability should be subjected to precisely the same treatment as the higher divisions of the animal kingdom. The advantages of a binomial system of nomenclature have not diminished since the days of Linnæus, though the views of the naturalist as to what constitutes a 'genus' or a 'species' have changed, and will probably continue to change, but, be that as it may, the Linnæan method is too simple and convenient to be abandoned without some better reason than the different value of these terms as employed in different zoological groups." "The practical point upon which all are agreed is that it is impossible to deal satisfactorily with the multifarious varieties of Foraminifera without a much freer use of distinctive names than is needful or indeed permissible amongst animals endowed with more stable characters." All who have had any experience of the life-history of these Rhizopods, who know their immense plasticness, and yet

who remember their, within certain limits of deviation, fixedness of type, will cordially agree with this.

The subject of dimorphism is alluded to, and the two quite distinct phenomena among Foraminifera described by this term are explained, but the author does not seem to select one of these above the other for the exclusive right to the term, as would seem desirable.

One of the most interesting subjects in reference to deep-sea deposits is their direct connection with the pelagic species of Foraminifera. As a rule these forms are not of pelagic habit; on the contrary, probably 93 or 99 per cent. of the known species or varieties live in the sand or mud of the sea-bottom, and possess no powers of floating or swimming; but, on the other hand, some few forms, belonging to eight or nine genera, do most certainly pass their existence either in part or in whole at the surface of the ocean, or floating at some depth below that surface. These forms are found, too, in immense profusion, and a relatively very large mass of the oceanic deposits consist of their calcareous shells. A list of the at present ascertained pelagic forms is given. The most prominent genera are Globigerina, Pulvinulina, Hastigerina, Pullenia. The question seems still unsettled as to whether the species are exclusively pelagic, passing the whole of their time living at or near the surface, or whether they can or do pass a certain portion of it on the sea-bottom. Mr. Brady adduces a series of facts which tend to the inference that the Foraminifera which are found living in the open ocean have also the power of supporting life on the surface of the bottom-ooze, and further, so far as our present knowledge goes, there is at least one variety of the genus Globigerina which lives only at the sea-bottom; but the author is most cautious not to express any dogmatic opinion on the subject.

In dealing with the composition of the test, the presence of a considerable percentage (6 to 10) of silica has been established as existing in the arenaceous forms. The substance secreted for the incorporation of the foreign bodies which cover the test has been proved to be composed of ferric oxide and carbonate of lime in variable proportions, the former being often in considerable excess. It is not without interest to note the presence in some of the porcellaneous forms of a thin siliceous investment. A few *Miliolæ* from soundings of a depth of about four and a half miles, with somewhat inflated segments, scarcely distinguishable in form from young thin-shelled specimens of a common littoral species, were found to be unaffected by treatment with acids, and upon further examination it became apparent that the normal calcareous shell had given place to a delicate homogeneous siliceous investment. While immersed in fluid, the shell-wall had the appearance of a nearly transparent film, and this when dried was at first somewhat iridescent.

A list is given of those stations from which soundings or dredgings were obtained in sufficient quantity to furnish good representative series of Rhizopods, and maps are appended showing the tracks of the *Challenger*, with these stations marked, as also of the areas explored by the *Porcupine* and the other northern expeditions.

Any generalised summary of the details of the new forms would be impossible. Of the several hundred species described and figured, over eighty are here noted

for the first time, and this without counting numerous well-marked and named varieties, or the numerous new forms already diagnosed in Mr. Brady's preliminary Reports.

The family Astrorhizidæ is the one which has received the largest number of additions; indeed our acquaintance with the larger arenaceous Rhizopods is almost entirely derived from the various recent deep-sea explorations. A knowledge of the life-history of these forms is still needed to place the classification of the group on a secure basis, and as some few of the forms are inhabitants of comparatively shallow water, their investigation would seem to be well worthy of the attention of observers at some of our zoological marine stations. Many other problems to be solved are also pointed out in this Report, the extreme value of which will be recognised by all students of biology.

#### THE ENGLISH FLOWER GARDEN

*The English Flower Garden: Style, Position, and Arrangement. Followed by a Description, Alphabetically Arranged, of all the Plants best suited for its Embellishment; their Culture, and Positions suited for each.* By W. Robinson, with the co-operation of many of the best Flower Gardeners of the day. Illustrated with many Engravings. (London: John Murray, 1883.)

A LOVE of flowers seems more or less characteristic of most human beings, and the tending and caring them is to most people a pleasant labour. Their brightness of colour, their charm of form, the sweetness and refreshingness of their varied perfumes please and delight the senses, while the mystery of their lives and deaths captivates the mind and awakes up the pleasures of hope. In no European country has this love of flowers been more manifested than in England, so that a flower garden seems an indispensable adjunct of an English home. It too often happens that many of those who love flowers have not the knowledge requisite to take care of them, and then the flower garden is handed over to the care of others. What to grow and what not to grow becomes then not so much a question of deliberate enlightened forethought as a thing of fashion, commonplace and unstable. No honest lover of Nature, no one who has once known the beauties of plant life, could ever for a moment remain pleased or satisfied with the arrangement of things out of place which is so peculiarly characteristic of one style of modern English gardening. It was not always thus: anywhere in Continental Europe that one visits "*Le Jardin anglais*" of some fine demesne or of some public park, there one is sure to find some attempt to form a natural prospect by the judicious arrangement of tree, shrub, flower, and grass; but in England itself, the very home of Sylvia, all traces of Nature are too often obliterated, and a meretricious display of colour, inclosed within a sharply defined geometrical sameness of outline, takes the place of a refreshing contrast in contour accompanied with joyful surprises of brightness. What a difference there is in the pleasure of viewing a large mass of *Gentiana acaulis* in the centre of a wide expanse of scarlet geraniums encircled with yellow calceolarias and viewing some few tufts of the same plant opening their blue corollas amid the grass by the borders of some Alpine meadow. Those who love gardens and like to see in them some few touches